Available online at www.sciencedirect.com

ScienceDirect

Procedia - Social and Behavioral Sciences 191 (2015) 2844 – 2848

Procedia
Social and Behavioral Sciences

WCES 2014

What Makes Redundant Presentation of Multimedia Learning Difficult?

Adem Soruç[a]*

[a]*Sakarya University, Faculty of Education, English Language Teaching Department, Hendek 54300, Sakarya/TURKEY*

Abstract

Research on multimedia learning and on reading comprehension has become ubiquitous over the last decades. Somewhat more specifically, redundancy principle of multimedia learning has been investigated a lot in many different, notably ESL, settings. Yet, much closer qualitative examinations are still needed. To this end, the present study aims to investigate firstly what kind of difficulties "EFL" students go through in redundant and non-redundant conditions and then how they feel about these presentations. Think-aloud protocols and interviews revealed a) split attention effect, b) the role of pictures with moving arrows and c) the importance of native/nonnative speaker speech. Implications are given and suggestions made for teachers and material developers at the end.

Selection and peer-review under responsibility of the Organizing Committee of WCES 2014

Keywords: Redundancy; multimedia learning; learner preference hypothesis; cognitive theory

1. Introduction

The last 15 years bear witness to a plethora of research studies conducted over whether multimedia learning is effective on language learning, notably on ESL reading comprehension and/or word recognition. Defined as providing information in a non-linear way by means of texts, graphics, sound, video, and animation (Mayer, 2001; 2005), hypermedia per se has become important in second language teaching. However, much research is still needed in especially EFL settings. Multimedia learning is based on two most important theories.

* Adem Soruç. Tel.: +90; (0264) 295 6724
E-mail address: adem_soruc@hotmail.com

Selection and peer-review under responsibility of the Organizing Committee of WCES 2014
doi:10.1016/j.sbspro.2015.04.402

a) information delivery view
b) cognitive view

Whereas the former supports to deliver all the necessary modes to learners so that they can choose the best one that suits their preferences, the latter supports to provide information both visually and verbally in a way that learners can disambiguate fragmentary messages through two sensory memory channels of working memory. The delivery view advocates that just as people can accommodate their preferences to improve their learning, so too can benefit from the choices presented in multimedia learning (Jonassen and Grabowski, 1993). It further states that when one delivery path (visual or verbal channels) is blocked, then the other can make up for the lack of input. Put it simply, it states that learners should have many choices. On the other hand, the cognitive view or Mayer's (2001, 2005) cognitive theory of multimedia learning advocates that learners construct knowledge first by selecting relevant visual and verbal information at the same time, then organizing it in different memory channels, and finally integrating the decoded information with preexisting knowledge. Redundancy occurs when learners see concurrent pictures and words or when a single modality is overused. In other words, the on-screen text/words become redundant when the identical information is delivered in the pictures or animation. The on-screen text overloads visual channel of working memory. This effect was found in the earlier, quantitative, studies (Kalyuga, Chandler, and Sweller, 1998, 1999, 2000; Mayer, 2001, 2005; Mayer, Heiser, & Lonn, 2001, Experiments 1 and 2; Craig, Gholson, & Driscoll, 2002; Leahy, Chandler, & Sweller, 2003; Diao & Sweller, 2007).

2. Prior studies

Mayer, Heiser, & Lonn (2001) exposed students to pictures or animation with on-screen text (redundant) and without on-screen text (non-redundant) and found that those in the redundant group recalled significantly less on retention test and produced considerably fewer creative solutions on transfer test than did students in the non-redundant group. The same effect was found again in the second experiment of the same study (Mayer et al., 2001) which this time exposed students to pictures or animations with summary on-screen and full on-screen text (redundant) and without on-screen text (non-redundant). Those in the redundant group performed less than those in the non-redundant. Whether the on-screen text (redundant) was summary or full did not produce a significant effect. Those receiving animation with narration without on-screen text recalled and produced more. In the following years the same effect was established (Craig et al., 2002; Kalyuga et al., 1998, 1999, 2000). This indicates that elimination of the redundant information (on-screen text) paves the better way for recall in retention tests; comprehension in production tests. For instance, Kalyuga et al. (1999) presented diagram in oral, visual modes and redundant conditions. The study compared students receiving concurrent diagrams with auditory verbal information or with on-screen text. The results showed that the diagram with on-screen text overburdened the capacity of visual mode and resulted to attention split in the working memory. This became established in the other studies of Kalyuga et al. (1998, 2000). Craig et al. (2002) exposed students to a speaking agent only, an agent with gestures and no agent presentations. Almost all students in the speaking agent only group outperformed those in the other two groups. Further, Craig et al. compared students in static picture, sudden onset, and animation groups and found out that students receiving sudden onset and animation presentations did significantly better than the students receiving static pictures. All these show that if redundant text is eliminated, two modalities are better than one modality. For instance, Leahy et al. (2003) in the second experiment compared students in an audio visual group with students in a visual only group. Graphs with identical taped instructions led students to understand more than those in the visual only group. It was because of the lack of on-screen text. Diao and Sweller (2007) looked into the effect of reading through hypermedia on word decoding and text comprehension and thus compared two groups: reading plus concurrent listening group and reading only group. As the integration of the meaning was difficult for the first group students, or as it created verbal redundancy, they did worse on word recognition measured by translation scores of the participants. Retention and transfer test results further showed that students' verbal memory in the first group was overburdened, thereby causing them to understand the text less than those in the reading only group. Almost all the studies reviewed so far investigated redundancy effect generally using quantitative data collection instruments (e.g. retention and transfer tests). The present research this time used qualitative data collection instruments differently (see methodology section). Further ignored in those studies is that they did not aim to investigate what other difficulties students may experience in redundant or non-redundant conditions; but rather aimed to find out quantitative or concrete data for retention or comprehension purposes. This was also addressed in the present study. In short, the tentative research questions in mind before beginning to the study were as:

a) What makes redundant presentation difficult for EFL students?
b) What do EFL students think about redundant/ non-redundant presentations?

3. Methodology

3.1. Participants

This study was based on qualitative research paradigm, thus aiming to find out emergent and soft data. The study was also a case study as it involved only two EFL students from a University in Turkey. They had pseudonyms as Hasan and Ali. Both studied English for almost eight years. Their TOEFL IBT scores were 105 and 110 respectively. Therefore, they were accepted as advanced level of English learners.

3.2. Materials

Computer based materials were prepared within two separate Power point slides: one was about photosynthesis; the other about earthquakes. Photosynthesis process was narrated with animation (AN), an 87-s presentation with nine slides. Earthquake process was both animated and narrated with on screen text (AN-T). As fully written text gave the same information as in the narration, AN-T presentation included redundancy. It was 90-s presentation with nine slides. These topics were selected intentionally as the participants' knowledge was equal and less on photosynthesis/earthquake processes at the beginning of the study.

3.3. Redundant (AN-T) and Non-redundant (AN) Presentations

Photosynthesis presentation (AN) included pointing activities to attract students' attention and a native speaker narrated the conditions. In the AN presentation the participants used both their visual and auditory channel simultaneously, thus both matched each other. In the AN-T presentation, however, a non-native speaker narrated the earthquake process without pointing activities, but with fully written texts on the slides. The on-screen text and animation both being visual, they overlapped each other, thus created redundancy.

3.4. Data Collection Instruments

3.4.1. Think-aloud protocols

Think-aloud protocols served as a main data collection instrument to find out what kind of difficulties the participants experienced while watching the AN and AN-T slides. Furthermore, they were helped to feel free enough to elucidate what they were thinking or finding difficult at that time. They were also given choice of using either their native language (Turkish) or target language (English). Both preferred their mother tongue. (Research question 1)

3.4.2. Interviews

After the participants completed think-aloud protocols, a semi-structured interview started with some questions prepared beforehand. The interview for each lasted twenty minutes in length. It was held in order to investigate what the participants thought about the AN and AN-T presentations. (Research question 2) Both used their mother tongue in the interviews.

3.5. Procedure

After the two participants watched piloted presentations about other topics than those in the study and after they were trained about think-aloud protocols, the research started. Both participants received AN and AN-T presentations but on different days. Once the slides were completed and think aloud protocols finished, the researcher then made interviews with each. Think aloud protocols and interviews were recorded, transcribed, coded,

and analyzed.

4. Findings

Pattern coding analysis found interesting results such as 1) split attention, 2) static or sudden pictures and 3) the role of native/non-native speaker**.**

4.1. Split attention

The redundant on-screen text overloaded visual working memory channel and caused visual split attention in AN-T group, whereas it did not create such an effect in AN group because the students were not exposed to a heavy extraneous cognitive load or because one modality was not used for two things. This split attention effect as a difficulty was also concretized in some of the earlier studies (e.g., Kalyuga et al., 1998, 1999, 2000).

Hasan while thinking aloud stated that "I noticed **t**he on screen text after the third picture or slide in AN-T presentation and soon after that I could not concentrate on the visual animation." Ali stated that "I had difficulty differentiating picture on the one hand and written text on the other." In the interview, Ali said that "I had to divide my mind into three: picture (animation), audio (narration), and text." But in AN presentation, both students admitted that pictures and narration matched quite better and that they found it more interesting and easier to follow.

4.2. Sudden Onset Activities

Both students thought aloud that the pointing activities or rolling arrows at the time of the narration had facilitative effect on their understanding the AN presentation better. Hasan claimed that these movements in the AN helped him remember the details visually. However in the AN-T which was lack of moving arrows, this time they stated that they searched for the arrows immediately when the presentation started but could not find. In the interview, Ali explained that "if the plates had moved upwards when they had collided in the AN-T, I would have seen how it happened much more clearly. They would have guided me where to look or where to pay attention." Hasan admitted that moving arrows would attract his attention much more and thus wanted to see how plates converged, diverged or collided in a more lively condition in the AN-T.

4.3. Non-native Speaker

The AN-T presentation was narrated by a non-native speaker; the AN presentation by native speaker. This created a problem. Both students found the narration from the non-native considerably more effective than the narration from the native. Both Ali and Hasan thought that they were feeling very comfortable in deciphering the pronunciation and stress of the non-native. In the AN, however, they both found it difficult or devoted extra effort to understand the native speaker pronunciation. In interview, Hasan stated that "I felt much more relaxed in the ANT, because I did not feel in a hurry as in the AN presentation." Ali similarly admitted that "I understood AN more than ANT, but the native speaker pronunciation in AN caused another complexity in my understanding the conditions in photosynthesis process, although my English level is good."

5. Discussion and suggestions

This study found that the on-screen text (AN-T) made the presentation difficult for both participants to understand. It caused hurdle on working memory. It caused split attention effect (Mayer et al., 2001), which was also supported by Mayer's (2001, 2005) cognitive theory of multimedia learning or "cognitive load theory" (Chandler & Sweller, 1991; Baddeley, 1992; Sweller, 1999). Further difficulty in the AN-T was the lack of moving arrows, thus causing difficulty about where to look or where to focus while it was narrated for the participants. The AN presentation, however, was easy to follow thanks to the arrows guiding or showing where to look at during animation. This result supports the previous studies (for instance, Craig et al., 2002). (Research question 1) The participants felt that they were more relaxed in the presentation narrated by the non-native unlike the one with native. It did not create complexity for them. In contrast, it helped them focus on the animation much more as they caught almost all of the non-native speaker speech. This provided "intelligibility" between the EFL participants and

the non-native speaker. Consequently, it prevented cognitive load (Chandler & Sweller, 1991; Baddeley, 1992; Sweller, 1999). However, the participants thought that the animation without on-screen text, although narrated by native speaker, was more fluent than the one with redundant text as the text distracted their attention (Research question 2)

The following suggestions can be made for English teachers or material writers.

i) On-screen text causes hurdle on visual processing channel even for advanced students
ii) In both types of slides, students should also see moving arrows to direct their attention to what is being narrated.
iii) Especially in EFL settings, materials should additionally include non-native speaker speech as well as the native as it not only makes students relaxed and the text easy to understand.
iv) Material writers should bear intelligibility in mind.

6. Conclusion

Some results of this study are consistent with those in the literature (for instance, split attention and moving activities), but the same outcomes this time did not come from the concrete quantitative data but came from qualitative thoughts or feelings. The influence of native/non-native narration was the emergent data as a difference from the earlier studies which have not sought after it to date. But all these should be considered within the limitations of the study such as limited number of students. And many more should be conducted with larger groups, notably in EFL settings.

Acknowledgement

The author thanks Prof. Dr. Ayşe Akyel for the practical and helpful guidance throughout the study.

References

Baddeley, A. D. (1992). Working memory. *Science*, *255*, 556–559.

Chandler, P., & Sweller, J. (1991). Cognitive load theory and the format of instruction. *Cognition and Instruction*, *8*, 293–332.

Craig, S. D., Gholson, B., & Driscoll, D. M. (2002). Animated pedagogical agents in multimedia educational environments: effects of agent properties, picture features, and redundancy. Journal of Educational Psychology, 94, 428 – 434.

Diao, Y., Sweller, J., (2007). Redundancy in foreign language reading comprehension instruction: Concurrent written and spoken presentations. *Learning and Instruction*, 17, 78 – 88.

Jonassen, D. H., & Grabowski, B. L. (1993). *Handbook of individual differences, learning, and instruction*. Hillsdale, NJ: Erlbaum

Kalyuga, S., Chandler, P., & Sweller, J. (1998). Levels of expertise and instructional design. *Human Factors*, *40*, 1–17.

Kalyuga, S., Chandler, P., & Sweller, J. (1999). Managing split-attention and redundancy in multimedia learning. *Applied Cognitive Psychology*, *13*, 351–371.

Kalyuga, S., Chandler, P., & Sweller, J. (2000). Incorporating learner experience into the design of multimedia instruction. *Journal of Educational Psychology, 92*(1), 126–136.

Leahy, W., Chandler, P., & Sweller, J. (2003). When auditory presentations should and should not be a component of multimedia instruction. *Applied Cognitive Psychology, 17*, 401–418.

Mayer, R. E., Heiser, J., & Lonn, S. (2001). Cognitive constraints on multimedia learning: When presenting more material results in less understanding. *Journal of Educational Psychology*, *93*, 187–198.

Mayer, R. E. (2001). *Multimedia learning.* New York: Cambridge University Press.

Mayer, R. E. (2005). Principles for reducing extraneous processing in multimedia learning: Coherence, signaling, redundancy, spatial contiguity, and temporal contiguity. In R. E. Mayer (Ed.), *Cambridge handbook of multimedia learning* (pp. 183–200). New York: Cambridge University Press.

Sweller, J. (1999). *Instructional design in technical areas.* Camberwell, Australia: ACER Press.